UNITED STATES DISTRICT COURT
WESTERN DISTRICT OF TEXAS
AUSTIN DIVISION

Intellectual Ventures I LLC and Intellectual Ventures II LLC, Plaintiffs, v. VMware, Inc., Defendant.	CIVIL ACTION NO. 1:19-cv-01075-ADA

DECLARATION OF DR. VIJAY MADISETTI, Ph.D.
IN SUPPORT OF PLAINTIFFS' CLAIM CONSTRUCTIONS FOR TERMS IN
U.S. PATENT NOS. RE43,051 AND RE44,818

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I, Vijay Madisetti, Ph.D., hereby declare:

I. INTRODUCTION

1. I am over the age of 18 and am competent to make this Declaration. I have personal knowledge, or have developed knowledge, of these technologies based upon my education, training, and/or experience, of the matters set forth herein.

2. I have been retained by counsel for plaintiffs Intellectual Ventures I LLC and Intellectual Ventures II LLC (collectively, "IV"), in the above matter. I am submitting this Declaration to address the meaning and construction of certain disputed terms in U.S Patent No. RE 43,051 ("'051 patent") and U.S Patent No. RE 44,818 ("'818 patent"). For the purposes of this Declaration, I have not been asked to opine on the meaning of any other disputed terms not addressed below.

II. QUALIFICATIONS AND PROFESSIONAL EXPERIENCE

3. I am an expert in the field of networking systems. I have studied, taught, practiced, and researched this field for over twenty-five years. I have summarized in this section my educational background, work experience, and other relevant qualifications. Attached hereto as Appendix A, is a true and correct copy of my *curriculum vitae* describing my background and experience.

4. I received my Bachelor of Technology (Honors) in Electronics and Electrical Communication Engineering at the Indian Institute of Technology (IIT) in Kharagpur, India in 1984. I obtained my Ph.D. in Electrical Engineering and Computer Science at the University of California, Berkeley, in 1989. I received the Demetri Angelakos Outstanding Graduate Student

Award from the University of California, Berkeley and the IEEE/ACM Ira M. Kay Memorial Paper Prize in 1989.

5. I am a tenured Professor in Electrical and Computer Engineering at the Georgia Institute of Technology ("Georgia Tech") for nearly 25 years, and I am knowledgeable and familiar with information technology infrastructures, designing and evaluating virtualized environments, virtual machine architecture and optimization, cloud technology, as well as wireless communications, microprocessor architecture, hardware, RF, cellular networks, ASIC design, computer engineering, embedded systems, digital signal processing, and associated software and firmware design for wireless and telecommunications terminals and base stations.

6. I have been working in the areas of cloud computing, workload modeling, virtualization, and benchmarking for over ten years. In the area of characterization, modeling and generation of workloads for cloud computing applications, I have created a synthetic workload generator for virtual environments that accepts benchmark and workload model specifications. I also developed a cloud workload specification language called, GT-CWSL, to provide a structured way for specification of application workloads. These approaches allow accurate characterization of virtualization and cloud performance and have been published in "Synthetic Workload Generation for Cloud Computing Applications," Journal of Software Engineering and Applications, 2011, Vol. 4, pp. 396-410. See also GAFFES: Design of a Globally Distributed File System, UC Berkeley Reports, CSD-87-361.pdf (1987) on distributed and virtualized file systems.

7. In other work related to virtualization, performance modeling, and data integration, I have developed cloud-based information integration and informatics framework, called CHISTAR, that allows integration of distributed and heterogeneous data into a common virtual

environment (on commodity hardware running hypervisors), and allows easier analysis and analytics to be performed. This research was presented as a cover feature in the Special Issue on Computing in Healthcare, *IEEE Computer Magazine*, in 2015 ("Healthcare Data Integration and Informatics in the Cloud").

8. Further, in my work on rapid prototyping of cloud-based virtual services and systems, I proposed a new methodology using loosely coupled virtual components that are not restricted by architecture or programming styles. This approach, shown below, creates virtual components that are then integrated and deployed effectively to realize improvements in deployment efficiency and time to deployment.

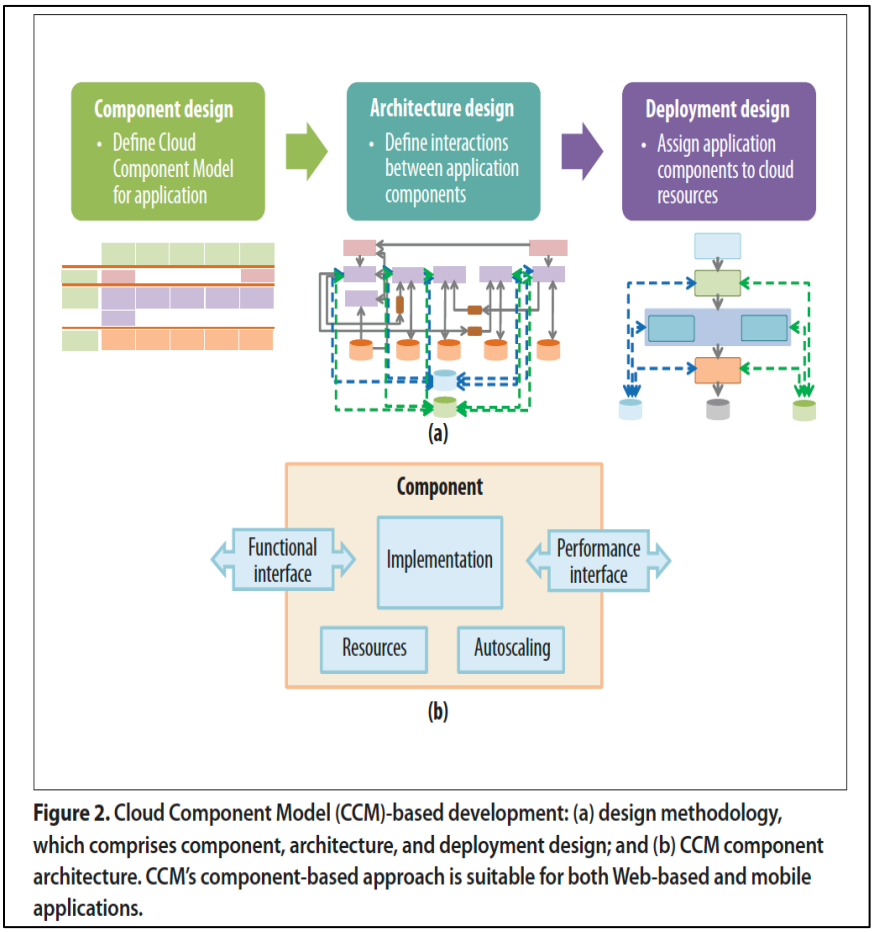


Figure 2. Cloud Component Model (CCM)-based development: (a) design methodology, which comprises component, architecture, and deployment design; and (b) CCM component architecture. CCM's component-based approach is suitable for both Web-based and mobile applications.

9. Generally, the use of our CCM-based virtualization and cloud component methodology improved throughput and response times. These results were published in the flagship journal, IEEE Computer Magazine, in November 2013. A. Bahga, V. Madisetti, "Rapid Prototyping of Advanced Cloud-Based Systems," IEEE Computer, vol. 46, no. 11, Nov. 2013, pp. 76-83.

10. Yet another relevant publication 1997 IEEE paper that concerned an open signal processing system design and implementation environment, BEEHIVE, that allows application developers to rapidly compose and debug functional specifications in a networked, distributed computing environment, and then later migrate the application (transparently) onto an embedded, distributed, computing hardware/software platform, with the capability to reconfigure (adaptively) the resources assigned to the application to meet the dynamic real-time requirements of the implementation. 1997 IEEE International Conference vol. 1, 21-24 April 1997, pp. 663 - 666.

11. In addition to research and commercialization projects in virtualization and cloud computing and advanced cloud applications and data analytics, I have also taught courses and written books in these areas. These books are widely used by dozens of universities all over the world - A Bahga, V. Madisetti Cloud Computing: A Hands-On Approach (2013); A Bahga, V. Madisetti, Internet of Things: A Hands-On Approach (2014); A Bahga, V. Madisetti, Big Data Science & Analytics: A Hands-On Approach (2016); A Bahga, V. Madisetti, Blockchain Applications: A Hands-On Approach (2017).

12. I have been an active consultant to industry and various research laboratories (including Massachusetts Institute of Technology Lincoln Labs and Johns Hopkins University Applied Physics Laboratory). I also have founded three companies in the areas of embedded

software, military chipsets involving imaging technology, and wireless communications, and I have supervised the Ph.D. dissertations of over twenty engineers in the areas of computer engineering, signal processing, communications, rapid prototyping, and system-level design methodology, of which five have resulted in thesis prizes or paper awards.

13. I have been elected a Fellow of the IEEE, for contributions to embedded computing systems. The Fellow is the highest grade of membership of the IEEE, a world professional body consisting of over 300,000 electrical and electronics engineers, with only one-tenth of one percent (0.1%) of the IEEE membership being elected to the Fellow grade each year. Election to Fellow is based upon votes cast by existing Fellows in IEEE.

14. I have authored more than sixty refereed journal publications and around forty peer reviewed conference publications, and I have submitted approximately fifty invention disclosures and provisional patents applications over the past ten years. At least fifteen are issued US patents.

15. I have testified as an expert witness before. Over the past six years, I've testified as an expert in more than 20 proceedings.

16. I am being compensated for my work in this case at my standard rate of $550 per hour (plus reimbursement for expenses) in connection with my preparation of this report, as well as for each hour spent providing deposition or testimony. This compensation is not contingent upon my performance, the outcome of this case, or any issues involved in or related to this case. I have no financial interest in this matter.

III. MATERIALS RELIED UPON IN FORMING MY OPINIONS

17. In preparing my opinions, I have reviewed the '051 and '818 patents and their prosecution histories, and have also reviewed the other documents and materials cited herein.

18. My opinions are also based upon my education, training, research, knowledge, and personal and professional experience.

IV. CLAIM CONSTRUCTION PRINCIPLES

19. I am not an attorney. Counsel for IV has informed me about several principles and standards of patent law, which I have used in developing my opinions expressed herein.

20. I have been informed that the claims of a patent define the scope of the invention and the patentee's rights. I have been told that patent claims generally should be interpreted consistent with their plain and ordinary meaning as would have been understood by persons of ordinary skill in the art, after reviewing the patent claim language, the specification, and the prosecution history (i.e., the intrinsic record). In this regard, I have also been told that, in order to determine the proper meaning of a disputed claim term, I first look to the claim language itself, the specification, and the prosecution history.

21. I have been informed that a single claim term should be construed consistently with its appearance in other places in the same claim or in other claims of the same patent, unless it is clear from the specification and prosecution history that the terms have different meanings at different portions of the claims.

22. I have been informed, as a general rule, that unless a patent applicant shows an intent to limit their invention, particular examples or embodiments discussed in the specification are not to be read into the claims as limitations. I have also been told that the construction that stays true to the claim language and most naturally aligns with the patent's description of the invention will be the correct construction.

23. I have been informed that extrinsic evidence outside the patent and prosecution history, such as expert testimony, treatises and dictionaries, may also be considered as an aid in arriving at the proper construction of a claim when a claim term is ambiguous.

24. I have been informed that 35 U.S.C. § 112 ¶ 6 (pre-AIA, now § 112(f)) states that "[a]n element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof." I have also been informed that when a claim uses the phrase "means for" to describe a limitation, it is presumed that § 112 ¶ 6 applies. Similarly, I understand that if a claim term does not use the word "means," there is a rebuttable presumption that 35 U.S.C. § 112, ¶ 6 does not apply to that claim term. I understand that when a claim term lacks the word "means," the presumption can be overcome and § 112, ¶ 6 will apply if the challenger demonstrates that the claim term fails to recite sufficiently definite structure or else recites function without reciting sufficient structure for performing that function. When that presumption is rebutted, I have been informed that that a "means-plus-function" limitation must be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

25. I have been informed that the procedure for construing a "means-plus-function" claim limitation involves first defining the function of the limitation, and then identifying the corresponding structure for that function. I have been informed that the function of a means-plus-function limitation is construed to include the limitations contained in the claim language, and only those limitations. Further, I have been informed that the corresponding structure is identified by looking at the specification and prosecution history of the patent. However, structure disclosed in

the specification or the prosecution history is considered "corresponding" structure only if the specification or prosecution history clearly links or associates that structure to the function recited in the claim. I have been informed that a bare statement that known techniques or methods can be used does not disclose structure, even if a person of skill in the art would be capable of implementing a structure.

V. LEVEL OF ORDINARY SKILL IN THE ART

26. I have been informed that there is a concept in patent law known as a person having ordinary skill in the art ("POSITA"). I have been informed that this concept refers to a person who is trained in the relevant technical field of a patent without possessing extraordinary or otherwise exceptional skill. Further, I have been informed that factors such as the education level of those working in the field, the sophistication of the technology, the types of problems encountered in the art, prior art solutions to those problems, and the speed at which innovations are made may help establish the level of skill in the art.

27. Taking these factors into consideration, it is my opinion that a person having ordinary skill in the art at the time the earliest applications for the '051 and '818 patents were filed would have had a bachelor's degree in electrical engineering, computer engineering, computer science, or a related field, and one to two years of experience in the design or development of networking systems, or the equivalent. Additional graduate education could substitute for professional experience, or significant experience in the field could substitute for formal education.

28. Based on my qualifications described above, I was at least a POSITA at the time the earliest applications for the '051 and '818 patents were filed. My opinions herein are from the perspective of a POSITA as of that date.

VI. OVERVIEW OF THE '051 PATENT

29. The '051 patent is titled "Enabling a Service Provider to Provide Intranet Services." It was filed September 19, 2007 and issued December 27, 2011. It claims priority to Application Priority Date March 15, 2000.

VII. OVERVIEW OF THE '818 PATENT

30. The '818 patent is titled "Quality of Service in Virtual Computing Environments." It was filed May 4, 2012 and issued March 25, 2014. It claims priority to Application Priority Date December 7, 2007.

VIII. THE '051 PATENT DISPUTED CLAIM TERMS

A. **"virtual server"** ('051 patent claims 1, 3, and 6)

Plaintiffs' Proposed Construction	Defendant's Proposed Construction
Plain and ordinary meaning Alternatively – "virtual machine(s) that reside(s) on a physical server and use(s) the physical server's resources, but [has/have] the appearance of being a separate, dedicated machine(s)"	"a process executing on a host computer that accepts communication requests"

31. In my opinion the term virtual server is a well-known and commonly used term among those of skill in the art and means exactly what it says; a virtualized server. A POSITA would readily understand that the term "virtual server" is referring to a virtualized server, without further explanation.

32. A virtual server is an example of a type of virtual machine that virtualizes physical server functionality. A POSITA would further understand and appreciate how the alternate phrasing "virtual machine that resides on a physical server and uses the physical server's resources, but has the appearance of being a separate, dedicated machine" illustrates the plain and ordinary meaning of a virtual server by way of a common example, without further explanation.

33. Examples of how "virtual server" and "virtual machine" were known and used in the art can be found in the following patent: U.S. Pat. No. 5,870,550.

B. "physical interface[s]" ('051 patent claims 1 and 3)

Plaintiffs' Proposed Construction	Defendant's Proposed Construction
Plain and ordinary meaning	"hardware that provides a point of communication between two or more devices"

34. In my opinion, the '051 patent uses term "physical interface(s)" unambiguously and in a manner entirely consistent with its well-established meaning in the art. The plain and ordinary meaning of this term would readily be understood by a POSITA as referring to an interface that is physical.

35. In my opinion, the wording proposed by Defendant's construction is too limiting, at least because the "between two or more devices" phrasing is narrower than the well-known meaning of "physical interface." For example, a wireless physical interface (e.g., a WLAN radio) can interface with a wireless medium or wireless network using radio wave signaling without specifically being connected to other discrete devices (e.g., passive scanning).

36. Examples of how "physical interface" was known and used in the art can be found in the following patents: U.S. Pat. No. 6,446,192 and U.S. Pat. No. 5,835,710.

C. "storing . . ." / "storing . . ." / "receiving . . ." / "determining . . ." / "determining . . ." / "sending . . ." / "using . . ." ('051 patent claims 1 and 3)

37. In my opinion, the '051 patent uses the well-understood terms "physical interface(s)" and "tunnel identifier(s)" combined in a clear and straightforward manner as recited in claims 1 and 3. It is apparent to me, as one of skill in the art, that the inventors are first referring to general instances of "physical interfaces" and "tunnel identifiers" at the beginning of the claims,

and subsequently referring to associated instance(s) of "a [physical interface/tunnel identifier]" followed sequentially by "the [physical interface/tunnel identifier]."

38. Further, I note that the final two instances of the disputed terms recited in claim 1 are worded as such: "determining . . . a physical interface and tunnel identifier" followed by "the determined [physical interface/tunnel identifier]." Similarly in claim 3, the final two instances of those terms are worded as such: "using . . . to identify a physical interface and tunnel identifier" / "the identified [physical interface/tunnel identifier]." In my opinion, the patentees additional use of the qualifying language "determined" / "identified" combined with the sequential ordering of these instances makes it clear to one of skill in the art that the two instances are associated.

39. In my opinion, but for the constituent term "customer forwarding table(s)/information," which I address elsewhere in this Declaration, each and every remaining term and limitation recited in the numerous disputed claim elements is well-understood and being used in its plain and ordinary manner as would readily be apparent to one of skill in the art. There is nothing in the specification that otherwise contradicts or purports to limit these terms to something different than their ordinary meanings.

D. "customer forwarding [table(s)/information]" ('051 patent claims 1 and 3)

Plaintiffs' Proposed Construction	Defendant's Proposed Construction
"table(s) containing [a set/sets] of customer specific forwarding information" / "set(s) of customer specific forwarding information"	See construction of "storing a customer lookup table, the customer lookup table storing associations between physical interfaces and tunnel identifiers identifying tunnels for private networks and a plurality of customer forwarding tables" / "storing . . . customer forwarding information, . . . the customer forwarding information associating network addresses with physical interfaces and tunnel identifiers"

40. In my opinion, adding the term "set" or "sets" where appropriate to assist in

differentiating singular versus plural instances of the claim terms at issue is a proper deviation from the plain and ordinary meaning of the terms that would be helpful in clarifying its intended meaning. Such wording is consistent with a POSITA's understanding of the terms in light of the specification, which clearly expresses that the invention as a whole can store multiple sets of customer forwarding information, but in the context of specific transmissions it can associate a specific set of customer forwarding information with a correct customer.

41. Further, it is well-understood that tables in the computing context contain information. This is further emphasized in the '051 patent specification for example at 11:58-61 where is states "customer 1's information is contained in customer forwarding table 910, and customer 2's information is contained in customer forwarding table 920." Thus, the addition of the word "information" to qualify the "table" variant promotes consistency with the broader "information" variant without substantively altering the meaning of either term.

IX. THE '818 PATENT DISPUTED CLAIM TERMS

A. **"hierarchical token bucket resource allocation" / "token(s)"** ('818 patent claims 1, 17, 30, 32 and 42)

Plaintiffs' Proposed Construction	Defendant's Proposed Construction
Plain and ordinary meaning	The specific class-based scheduling algorithm known in the art as the "hierarchical token bucket" / "token" as used in "hierarchical token bucket resource allocation"

42. In my opinion, the concept of a "hierarchical token bucket" is one that a POSITA would readily have understand in view of the specification. The specification's usage of the disputed term itself and related terms (e.g., "hierarchical," "hierarchical QoS [management] process," "QoS process at each hierarchical tier," "hierarchy," "token," "token bucket," "resources," "allocation," "tier," "parent," "child," "node," "root," "leaf," "non-leaf," "class," etc.)

in conjunction with the accompanying description and examples is fully consistent with the known understanding of hierarchical token bucket approaches in the art.

43. Although the concept of a hierarchical token bucket algorithm (e.g., in Linux) existed prior to the invention of the '818 patent, the general concept of a hierarchical token bucket approach had been implemented into numerous additional systems and methods and was not understood as referring to a specific, particular algorithm or application, but rather the general idea of using e.g., a tiered, tree-like arrangement of token buckets to represent a system of nodes, layers, interfaces, and/or resources.

44. In the '818 patent, the specification describes examples of hierarchical token bucket algorithms implemented in the larger context of the claimed virtual input/output (I/O) QoS management and resource allocation systems and methods. In light of the above, it is my opinion that a POSITA would have understood the disputed term to be consistent with its plain and ordinary meaning as further exemplified in the specification.

45. Examples of how "hierarchical" and "token bucket" were known and used in the art can be found in the following patents: U.S. Pat. No. 5,689,508; U.S. Pat. No. 5,864,540, EP1221214A1.

B. "enforcing . . ." / "receiv[e/ing] . . ." / "classify[ing] . . ." / "compar[e/ing] . . ." / "forward[ing] . . ." / "buffer[ing] . . ." ('818 patent claims 1, 17, 30, 32, 33, 37-39, 42)

Plaintiffs' Proposed Construction	Defendant's Proposed Construction
Plain and ordinary meaning	"enforcing . . . across the physical [storage network] interface of the virtual I/O server" / "receiv[e/ing] in the virtual I/O server" / "classify[ing] in the virtual I/O server" / "compar[e/ing] in the virtual I/O server" / "forward[ing] in the virtual I/O server" / "buffer[ing] in the virtual I/O server"

46. In my opinion a POSITA would not seek to import the structural limitation of a virtual input/output server from embodiments of the specification into nearly every element of the claims. Each of the literal claim terms at issue are used clearly and unambiguously throughout the claims in a manner consistent with the specification and would be readily understood by a POSITA in accordance with their plain and ordinary meaning.

47. Considering the entire context of claims 1, 17, 30, 32, 33, 37-39, 42, the surrounding claim language that precedes and follows the disputed terms qualifies and sequences the claim language in a manner that would have fully enabled one of skill in the art to parse the claim language and practice the claimed invention. Thus, in my opinion, there is no need to read in additional "virtual I/O server" limitations to further qualify the explicit claim language since the meaning of each disputed term, claim element, and claim in its entirety would have been clear, unambiguous, and structurally complete to a POSITA without repeatedly needing to reference a virtual I/O server.

C. "maintain[ing] a connection over a network fabric" ('818 patent claims 1, 17, 30, 32, 42)

Plaintiffs' Proposed Construction	Defendant's Proposed Construction
Plain and ordinary meaning	"maintaining a connection between the physical interface of the application server and the physical interface of the virtual I/O server over a network fabric"

48. In my opinion, taking the entire claim element in context, the structural relationships between "a connection," "a network fabric," and "a virtual interface layer of an application server" are clearly defined as written. A POSITA would have readily understood these relationships in light of the claim itself and the specification thus, in my opinion, importing two additional structural limitations ("the physical interface") would be improper since connections could readily be understood in the art as logical or virtual, as opposed to physical.

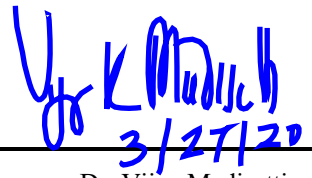
49. In each of claims 1, 17, 30, 32, and 42, the disputed claim term is followed and qualified by the limitation "virtual [network/storage network] interface layer," which would have further suggested to one of skill in the art that a virtual structure is being claimed in that particular claim element. In my opinion, it would have been inappropriate for one of skill in the art to read unclaimed physical limitations into a claim element (or claim in general) that is reciting virtual structure.

D. Alleged Means Plus Function Elements ('818 patent claim 17)

50. In my opinion the claimed phrase "input/output virtualization module" connotes distinct structure to a POSITA. Further, the claim language itself connotes sufficiently definite structure, as it includes "an input/output fabric interface," "a storage network interface," "one or more processors," and "a memory." Each of these are defined structural elements as would be understood by a POSITA without additional limitations.

I declare under penalty of perjury that the foregoing is true and correct.

Dated: March 27, 2020

Signed: 

Dr. Vijay Madisetti

APPENDIX A

Dr. Vijay K. Madisetti
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56 Creekside Park Drive
Johns Creek, GA 30022

Employment:

- 1984-1989: Post Graduate Researcher (UC Berkeley),
- 1989-present: Full Professor of Electrical & Computer Engineering (**Georgia Tech, Atlanta, GA 30332**).

Areas of Technical Interest – Wireless & Mobile Communications, Computer Engineering, Circuit Design (Analog/Digital), Software Engineering, Digital Signal Processing, Wireline & Wireless Computer Networks, Software Systems**,** Control Systems, Cloud Computing.

Startup Companies:

Director, **VP Technologies, Inc**. (1995-): A startup commercialized through Georgia Tech's Advanced Technology Development Corporation (ATDC) focusing on digital software and hardware design services for military market. http://www.vptinc.com

Director, **Soft Networks, LLC** (2001-2007): A startup commercialized through Georgia Tech support focusing on software development tools and compilers for Cellular/WiFi/VOIP/telecommunication products. http://www.soft-networks.com

Director, **Elastic Video Inc.** (2007- 2009): A startup commercialized through Georgia Tech's VentureLab (http://venturelab.gatech.edu) development image and video processing software for wireless & IP networking.

Litigation Experience (2011-2019) With Testimony

(Note: There may be multiple cases between the parties, e.g., District Court v. ITC, US versus Foreign Cases)

Case Name: HTC v. IPCOM
Case No: 1:2008-cv-01897 (District of Columbia)
Expert for IPCOM
(3G Standards: 2009 – 2012)
Testified by deposition

Case Name: Apple v. Kodak
Case No. ITC 337-TA-717 (ITC)
Expert for Kodak
(Digital Image Processing & UI: 2008-2011)
Testified at trial

Case Name: Harkabi v. Sandisk,
Case No: 1:08-cv-08203-WHP (SDNY)
Expert for Harkabi
(Digital Rights Management for Flash Devices: 2010-2012)
Testified at trial

Case Name: Yangaroo Inc. v. Destiny Media Technologies, Inc.
Case No: 09-C-0462 (ED Wisconsin)
Expert for Yangaroo.
(Digital Rights Management Streaming: 2010-2011)
Testified by deposition

Case Name: Motorola v. Microsoft,
Case No: ITC 337-TA-752
Expert for Motorola
(Peer to Peer Gaming: 2011-2013)
Testified at trial

Case Name: Motorola v. Apple,
Case No: ITC 337-TA-745 (ITC)
Expert for Motorola
(Mobile Applications & UI: 2011-2012)
Testified at trial

Case Name: Innovative Sonic Ltd. vs. RIM
Case No: 3:11-cv-00706-K-BF (ND Dallas)
Expert for Innovative Sonic Ltd
(3G Standards – Encryption, HSDPA: 2010-2013)
Testified at trial

Case Name: Interdigital v. ZTE et al (JDA)
Case No: ITC 337-TA-800
Expert for JDA
(3G Standards – HSDPA: 2012-2013)
Testified at trial

Case Name: Kodak v. Apple, HTC
Case No: ITC 337-TA-831
Expert for Kodak
(Digital Image Processing & UIs: 2011-2012)
Submitted reports

Case Name: Calypso v. T-Mobile
Case No: 2:08-CV-441-JRG-RSP [ED Texas]
Expert for T-Mobile
(Unified Communications: 2012-2013)
Testified by deposition

Case Name: TracBeam v. AT&T
Case No: 6:11-cv-00096-LED [ED Texas]
Expert for AT&T
(GPS Services: 2011-2012)
Testified by deposition

Case Name: BT v. Cox/Comcast
Case No: 10-658 (SLR) (District of Delaware)
Expert for Cox and Comcast
(VOIP, Network Management: 2012-2014)
Testified by deposition

Case Name: Ericsson v. Samsung
Case No: 337-TA-862 (ITC)
Expert for Ericsson
(RF Receivers, EDGE Standards: 2012- 2013)
Testified at trial

Case Name: IPR – ContentGuard v. ZTE
Case No: (PTAB)
Expert for ZTE
(DRM for Digital Devices: 2012-2014)
Testified by deposition

Case Name: Emblaze v. Apple
Case No: 5:11-cv-01079-PSG (ND Cal)
Expert for Emblaze
(Digital Video/Audio Streaming: 2012-2014)
Testified at trial

Case Name: Emblaze v. Microsoft
Case No: 3:12-cv-05422-JST (ND Cal)
Expert for Emblaze
(Digital Video/Audio Streaming: 2012 - Present)
Ongoing

Case Name: MMI v. RIM
Case No: 2:10-cv-00113-TJW-CE (ED Texas)
Expert for MMI
(Area: Mobile Devices/User Interfaces: 2012- 2013)
Testified by deposition

Case Name: Wi-LAN v. Apple
Case No: 13-cv-0790 DMS (ED Texas)
Case No: 3:14-cv-010507-DMS-BLM
Expert for Wi-LAN
(Area: 4G/3G Wireless Communications: 2013 –2018)
Testified by Deposition

Case Name: Sentius LLC v. Microsoft
Case No: 5:13-cv-00825-PSG (ND Cal)
Expert for Sentius
(Area: Enterprise Software Systems: 2014-2015)
Testified by deposition

Case Name: Medius Eagle Harbor v. Ford
Case No: 3:1-cv-05503-BHS (WD Washington)
Expert for Medius Tech
(Area: Automotive Multimedia Systems: 2014-2016)
Testified at Trial

Genband US LLC v. Metaswitch Networks
No 2:14-cv-33 (E.D. Texas)
Expert for Metaswitch Networks
Technology: Voice & Data Over IP Networks (2014-2015)
Submitted declarations & deposition

Enterprise - Systems Technologies S.a.r.l v. Samsung Electronics Co. Ltd
Case No: 6:14-cv-555-MHS (ED Texas) and ITC Inv. No. 337-TA-925
Expert for Samsung
Technology: Android Operating System (2014-2015)
Testified by deposition

Ericsson Inc. v. Apple Inc.
Case No: 2:15-cv-287 (ED Texas) and ITC-337-952/953
Expert for Ericsson
Technology: 4G Wireless Systems (2015 – present)
Testified by deposition & Trial

Intellectual Ventures LLC v. Motorola Mobility LLC (Google)
Case No: 13-cv-61358-RST (S.D. Florida)
Expert for Google
Technology: Wireless Systems (2013- present)
Testified by deposition (IPR)

Intellectual Ventures LLC v. Nikon Corp
C.A No. 11-1025-SLR (District of Delaware)
Expert for Nikon
Technology: Wireless Systems (WiFi) (2014-2015)
Submitted declarations

Masimo v. Mindray Biomedical Electronics Co. / Philips
Case No: SACV-12-02206 CJC (JPRx) (C.D. California)
8:12-cv-02206-CJC-JPR
Expert for Masimo
Technology: Pulse Oximetry (2014 – 2016)
Submitted reports, testified by deposition

Samsung v. Nvidia
Case No: 3:14-cv-757-REP ED Virginia
Expert for Samsung
Technology: Microprocessors & Memories (2014 – 2016)
Submitted reports & Deposition & Trial

Chrimar v. HP/Cisco/Alcatel/Dell/Adtran/AeroHive/D-Link/TP-Link/TrendNet/Juniper Networks/CoStar/Accton/AMX
Case No: 4:13-cv-1300-JSW, Case 6:15-cv-163 (ED Texas)
Case No: 6:15-cv-00618-JRG-JDL (ED Texas)
Expert for Chrimar
Technology: Power over Ethernet (2015-2017)
Submitted reports & Deposition & Trial

Chamberlain v. Ryobi/TTI
Case No: 1:16-cv-06097 (ND Illinois)
Expert for Ryobi
Technology: Wireless/IoT/Barrier Movement (2016 – present)
Submitted reports & deposition & trial testimony

IOEngine v. IMC/Imation
Case No: cv-14-1572-GMS (US Delaware)
Expert for IMC/Imation
Technology: Networked Storage Device (2016-2017)
Submitted reports & deposition & trial testimony

Huawei v. Samsung
Case No: 3:16-cv-2787-WHO (ND Cal)
Expert for Samsung
Technology: 4G/LTE Random Access Protocols (2016-present)
Submitted reports & deposition

Hitachi Maxell v. ZTE/Huawei
Case No: 5:16-cv-00178-RWS (ED Texas)
Expert for Hitachi Maxell
Technology: Digital Cameras
Submitted reports & deposition (2017 – 2018)

Qualcomm v. Apple
Case No: 17-ccv-0108-GPC-MDD (SD Cal) Also, Related ITC/FTC Matters
Expert for Qualcomm
Technology: 4G/Wireless Communications/Smartphones (2017-2019)
Submitted Reports and Deposition

Qualcomm v. Apple
Case No: 3:17-cv-01375-DMS-MDD (SD Cal)
Expert for Qualcomm
Technology: 4G/Wireless Communications/Smartphones (2017-2019)
Submitted Reports and Deposition

Optis v. Huawei
Case No: 2:17-cv-123 (E.D. Texas)
Expert for Optis Wireless
Technology: 4G/Video (2017-2019)
Submitted reports & deposition

Broadcom v. Sony
Case No: 8:16-cv-1052 (PTAB and Central Cal)
Expert for Broadcom
Technology: Wi Fi
No activity - settled (2017 – 2017)

Ameranth v. Hyatt Corporation
Case No: 3:11-cv-1810 (SD Cal)
Expert for Hyatt
Technology: Wireless eCommerce Applications (2017-2018)
Expert Technical consulting

Rovi v. Comcast
ITC No. 337-TA-1103 (ITC)
Expert for Rovi
Technology: Digital Video & interactive GUI (Jan 2018-May 2018)
Reports and Deposition

Beckman Coulter v. Sysmex
Case No: 1:17-cv-24049-DPG (ND Illinois)
Expert for Sysmex
Technology: Medical Instrumentation Automation (2017-present)
Testifying Expert

TQ Delta
Expert for TQ Delta
Technology: DSL Technologies (2018-present)
Testifying Expert

3GL/KPN v. LG, Blackberry, HTC
Expert for 3GL/KPN
Technology: 4G/LTE Protocols (2018-present)
Reports and Deposition / Testifying Expert

Cirba/Densify v. VMWare
Case No: 1:19-cv-00742-LPS
Expert for Cirba/Densify
Technology: Virtualization (2019-present)
Reports Deposition/PI Hearing / Testifying Expert

Power Integrations v. On Semiconductor
Case No: 17-cv-03189-BLF
Expert for On Semiconductor
Technology: Power Electronics (2018-present)
Reports & Deposition/Testifying Expert.

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Expert for WiLan
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Additional matters include declarations supporting IPRs at the PTAB for Google (US Patent 8,601,154), On Semiconductor (US Patent 6,212,079), Ubisoft (US Patent 5,490,216), Broadcom (WiFi), Sony (US Patent 6,101,534), Kia, (US Patent 5,530,431), Qualcomm, Fortinet (US patent 6,195,587), and ZTE (US Patent 7,523,072), and Ericsson, Amazon, Ring, Digital Ally, On Semiconductor, United Patents, Lenovo, BMC Software.

Earned Degrees

1. **B. Tech (Hons), Electronics & Electrical Comm. Engineering**
   Indian Institute of Technology (IIT), Kharagpur, India
   1984.

2. **Ph.D., Electrical Engineering & Computer Sciences (EECS)**
   University of California (UC), Berkeley. CA
   1989.

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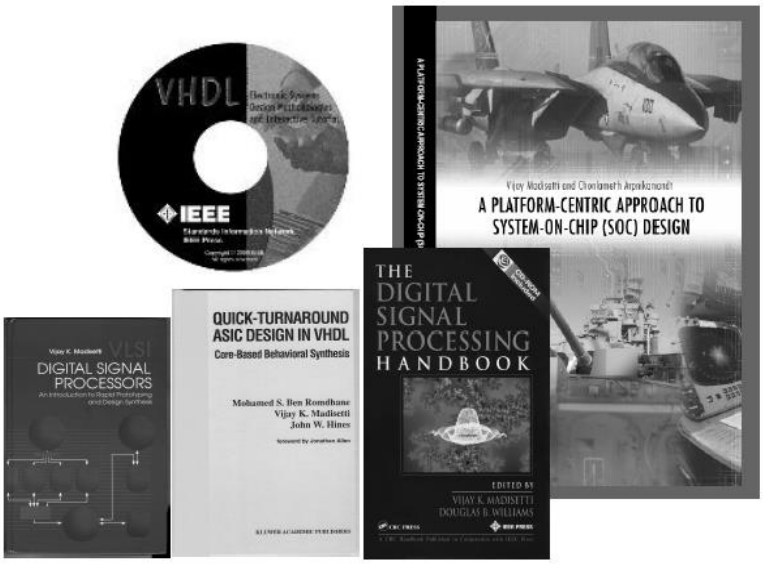

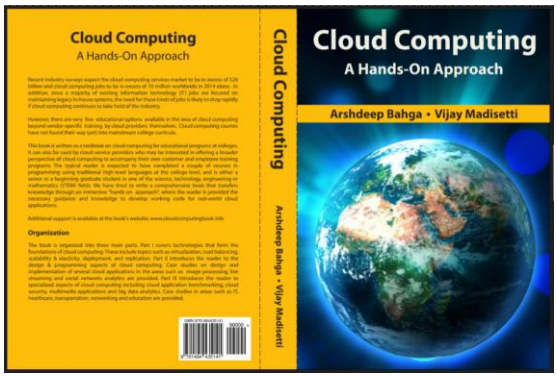

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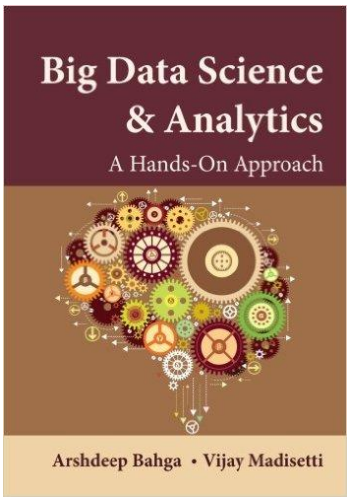

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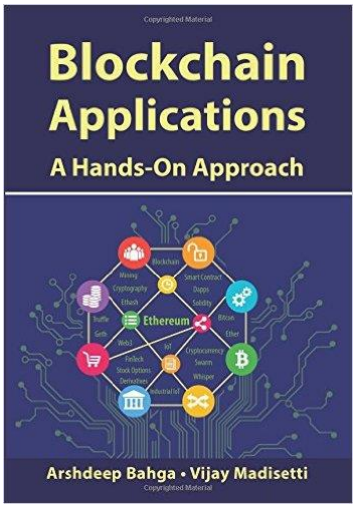

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Ph.D. Students Graduated

1. **Brian T. Kelley, 1992**
   VLSI Computing Architectures for High Speed Signal Processing
   Member of Technical Staff, Motorola.

   Winner of Dr. Thurgood Marshall Dissertation Fellowship Award

2. **Bryce A. Curtis, 1992**
   Special Instruction Set Multiple Chip Computer for DSP
   Member of Technical Staff, IBM

3. **Jaejin Lee, 1994**
   Robust Multitrack Codes for the Magnetic Channel
   Professor, Yonsei University, Korea

4. **Mohamed S. Ben Romdhane, 1995**
   Design Synthesis of Application-Specific IC for DSP
   Director of IP, Rockwell.

5. **Shoab A. Khan, 1995**
   Logic and Algorithm Partitioning on MCMs
   Professor, National University of Science & Technology, Pakistan

6. **Lan-Rong Dung, 1997**
   VHDL-based Conceptual Prototyping of Embedded DSP Architectures
   Professor, National Chaio Tung University, Taiwan.

Winner of VHDL International Best PhD Thesis Award, 1997

7. **Thomas W. Egolf, 1997**
   Virtual Prototyping of Embedded DSP Systems
   Distinguished Member of Technical Staff, Agere

8. **Alvaro Marenco, 1997**
   On Homomorphic Deconvolution of Bandpass Signals
   Professor, Texas A&M University.

   Winner of GIT ECE Outstanding Teaching Assistant Award

9. **Shahram Famorzadeh, 1997**
   BEEHIVE: A Distributed Environment for Adaptive Signal Processing
   Member of Technical Staff, Rockwell.

10. **Timothy J. Klausutis, 1997**
    Adaptive Lapped Transforms with Applications to Image Coding.
    US Air Force/Univ. of Florida.

11. **Lan Shen, 1998**
    Temporal Design of Core-Based Systems
    Member of Technical Staff, IBM

12. **James DeBardelaben, 1998**
    Optimization Based Approach to Cost Effective DSP Design
    Research Scientist, Johns Hopkins University

    Georgia Tech ECE Faculty Award

13. **Sangyoun Lee, 1999**
    Design of Robust Video Signal Processors
    Professor, Yonsei University

    US Army Sensors Lab Research Excellence Award, 1999

14. **Rahmi Hezar, 2000**
    Oversampled Digital Filters
    Member of Technical Staff, Texas Instruments

15. **Yong-kyu Jung, 2001**
    Model-Based Processor Synthesis
    Professor, Texas A&M University

16. **Mustafa Turkboylari, 2002**
    Handoff Algorithms for Wireless Applications
    Member of Technical Staff, Texas Instruments

17. **Yun-Hui Fan, 2002**
    A Stereo Audio Coder with Nearly Constant Signal to Noise Ratio
    Post-Doctoral Research Associate, Northeastern University

18. **Subrato K. De, 2002**

Design of a Retargetable Compiler for DSP
Member of Technical Staff, Qualcomm

US Army Sensors Lab Research Excellence Award, 1999

19. Chonlameth Aripnikanondt, 2004
System-on-Chip Design with UML
Professor, King Mongkut's University, Thailand.

US Army Sensors Lab Research Excellence Award, 1999

20. Loran Jatunov, 2004
Performance Analysis of 3G CDMA Systems
Senior Research Scientist, Soft Networks, LLC.

21. Antonios Argyriou, 2005, Serving in Hellenic Army.

22. Pilho Kim, 2009, Scientist, VP Technologies, Inc.

23. M. Sinnokrot, 2009, Staff Engineer, Qualcomm.

Awards & Honors

1. **Jagasdis Bose National Science Talent Fellowship**, Indian Institute of Technology, Kharagpur, 1980-1984.

2. **General Proficiency Prize**, Indian Institute of Technology, Kharagpur, 1984.

3. **Demetri Angelakos Outstanding Graduate Student Award**, Univ. of California, Berkeley, 1989

4. **Ira Kay IEEE/ACM Best Paper Award** for Best Paper presented at IEEE Annual Simulation Symposium, 1989

5. **IBM Faculty Development Award** 1990

6. **Technical Program Chair**, IEEE Workshop on Parallel and Distributed Simulation. 1990.

7. **Technical Program Chair**, IEEE MASCOTS'94

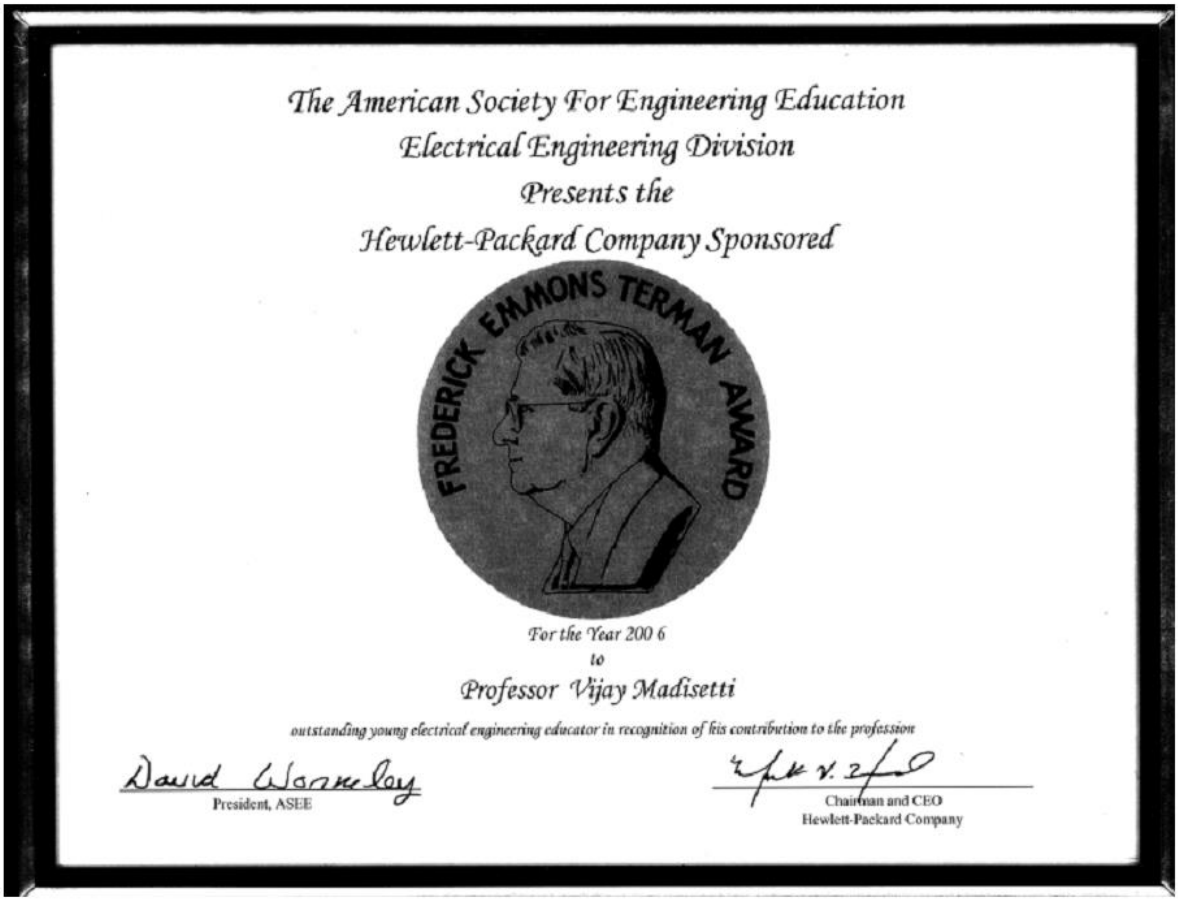
8. **NSF RI Award**, 1990

9. **VHDL International Best PhD Dissertation Advisor Award**, 1997

10. **Georgia Tech Outstanding Doctoral Dissertation Advisor Award**, 2001.

11. **ASEE 2006 Frederick Emmons Terman Medal, 2006.**

12. **Fellow of IEEE**



Intellectual Property Disclosures (Georgia Tech)

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2825	2003	Method and Apparatus for Optimal Partitioning and Ordering of Antennas for Layered Space-Time Block Codes in MIMO Communications Systems
2815	2003	How to Rapidly Develop a SyD Application
GSU-023	2003	Rapid Development of SyD Applications

2810	2003	System on Mobile Devices Middleware Design
2718	2003	A Transport Layer Algorithm for Improved Anycast Communication
2717	2003	A Novel Transport Layer Load-Balancing Algorithm
2716	2003	A Transport Layer QoS Algorithm
2715	2003	A Novel Transport Layer Algorithm for MPLS Performance
2659	2002	A New Algorithm and Technology for Implementing Mobile IP with Applications to Voice and Video over Mobile IP
2656	2002	Debugging with Instruction-Level Reverse Execution
2655	2002	Embedded Software Streaming
2539		System of Databases: An Enabling Technology for Programming
2517	2002	A Dynamic Instantiated Real-Time Operating System Debugger
2516	2002	A Dynamic Real-Time Operating System
GSU-009	2001	System of Databases: Architecture,, Global Queries, Triggers and Constraints
2480	2001	Mobile Fleet Application based on SyD Technology
2479	2001	System of Databases: A model with coordination links and a calendar application
1893	1999	Beehive
1726	1995	Very High Scale Integrated Circuit Hardware Description Language Models (VHDL Models)
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Issued Patents: 9,935,772, 9,769,213